SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1261.—Vol. XXIX.] LONDON, SATURDAY, OCTOBER 22, 1859. [WITH JOURNAL] STAMPED.... SIXPENCE. UNSTAMPED. FIVEPENCE.

MINERAL WEALTH OF NEW ZEALAND.

We have been favoured with the report, prepared by order of the New Zealand Government, of a very interesting lecture delivered at the Auckland Mechanics' Institute, by Dr. FERDINAND HOCHSTETTER, on "The Geology of the Province of Auckland." Dr. Hochstetter has completed his survey, and finished his geological map of the Auckland district—having given particular attention to the southern districts, which have hitherto been almost unknown and totally unsurveyed. As no fossils have yet been found of arenaceous formation in New Zealand, it is impossible to state the exact age: Dr. Hochstetter is, however, of opinion that these argillaceous siliceous rocks will be found to correspond to the oldest Silurian strata of Europe. The existence and great extent of this formation are of considerable importance to the province, as all the metalliferous veins hitherto discovered, or likely to be hereafter found, occur in rocks of this formation. To these rocks belong the copper pyrites which has been worked for some time at the Kawau and Great Barrier, the manganese at Waiheki, and the gold-bearing quartz at Coromandel. In the secondary formation are remarkable specimens of marine fossils, especially cephalopods of the genera Ammonite and Belemnite. To the older tertiary formation of Auckland belong the brown coal seams, on the intelligent working of which much of the future welfare of the province depends. The brown coal formation is of very considerable extent, both in the northern and middle islands of New Zealand, and is of similar character everywhere.

With regard to the coal of the Drury and Hunua districts, Dr. Hochstetter states that the Drury coal belongs to a very good class of brown coal—to the so-called *glanzkohle* with conchoidal fracture. He was not able to convince himself of the existence of different series of seams, one above the other on different levels. He is much rather of opinion that the same seam, disturbed in its level, occurs at the different localities in the Drury and Hunua district, where coal is found. The average thickness of that seam may be estimated at 6 ft., and it consists of three portions—the upper part laminated coal of inferior quality, 1 ft.; then a band of shale, 2 in.; the middle part coal of good quality, 1 ft. 6 in.; then a band of bituminous shale, 6 in.; the lowest part coal of the best quality he has seen, 2 ft. 6 in.; the bituminous shale accompanying the coal contains fossil plants, principally leaves of *dicotyledones*. It is remarkable that no fossil ferns are found in connection with the Drury coal, more particularly as on the west coast, seven miles from Wiakato Heads only, fossil ferns in a most beautiful state of preservation are embedded in grey argillaceous strata, alternating with sandstone and small coal seams, of probably the same geological age as the Drury coal. A considerable number of specimens from both localities will, by a future examination, furnish the opportunity for determining the principal features of the flora of the brown coal periods of New Zealand. The thickness of the forest, and the inaccessibility of the country, prevent for now ascertaining the exact extent of the Drury coal field. Still the existing openings show an extent of the coal field quite large enough to encourage any company to work the coal in an extensive manner, and a company has already been formed—the Waihoihoi Mining and Coal Company—for commencing operations upon the coal. The same kind of coal he saw again on the northern stope of the Taupiri and Hakarimata range. At Taupiri, on the left bank of the Waikato, he examined a beautiful seam about 20 ft. above the level of the river. The thickness of the seam then exposed was about 15 ft.; how much greater it may be it is impossible to say, as the floor has never been uncovered. This is the seam to which the attention of the inhabitants of Auckland was directed several years ago by the Rev. A. C. Purchas. He believes several tons were at that time brought to Auckland, but owing to various circumstances—the chief of which was the native ownership—the hope of obtaining a supply thence for Auckland was abandoned. No better position could, however, be found for mining purposes, and the day cannot be far distant when it will be worked to supply fuel for the steam navigation of the Waikato—the main artery of the province of Auckland.

Dr. Hochstetter has reason to believe that a coal field of considerable extent exists on the borders of the wide plains on both sides of the Waikato, between Taupiri and Mangatawhiri, for which district, shut in on all sides by ranges, he proposes the general geographical name of the Lower Waikato basin. A third coal field exists on the western and southern boundaries of the fertile alluvial plains above the junction of the Waipa with Waikato, which may be distinguished as the Middle Waikato basin—the future granary of the northern portion of the island. The localities in which coal has been discovered are—In the Hohinipanga range, west of Orakariki, on the Waipa; near Mohoanui and Waitaiheke, in the Hauhau range, on the upper branches of the Waipa; and again in the Whaingarua and Parepare ranges on the northern side of the Rangitoto. After giving the analyses of the New Zealand coal, which have already been published in the *Mining Journal*, he adds, upon the commercial value and applicability of the New Zealand brown coal, that although of entirely different character, and, generally speaking, of inferior value to the older coals of the primary formations, he cannot see any reason why this kind of coal should not be used in New Zealand for the same purposes as a similar brown coal is extensively applied in various parts of Europe, and particularly in Germany, where it supplies the fuel for manufactures of all kinds, for locomotives and steamers, and for domestic purposes. He was perfectly familiar with this kind of coal, and could assure the people of Auckland that their brown coal was quite as good as that which is used in Germany for the purposes mentioned. He would strongly recommend that any company which may be formed for the purpose of working the coal should at the same time establish potteries for the manufacture of earthenware. Remarkably suitable clays, of every necessary variety, have been shown to exist in the immediate neighbourhood of the coal fields by the Government borings. By the establishment of such works the value of the coal would be made apparent to everybody, and the manufacture itself, if properly conducted, could not fail to be remunerative. It may be interesting to know that the far-famed "Bohemian porcelain" is burnt by means of brown coal, from a seam of, in some places, 90 feet thickness.

The limestone formation; the stalactite caves of Tanauriuri, at Hangatiki, and of Parianewanewa, near the sources of the Waipa—the former haunts of the gigantic moa; the subterranean passages of the rivers in the Pehiope and Mairoa district; the volcanic formations and phenomena; the hot springs, &c., are in turn described, the lecture being thus rendered an entertaining as well as an invaluable document.

THE MINES AND MINING DISTRICTS OF WEST CORNWALL.—No. I.

The county of Cornwall extends south-west, from the River Tamar to the Land's End, for a distance of about 75 miles, between the Bristol and English Channels. Its width is greatest along the line of the Tamar, its eastern boundary, where it reaches to about 45 miles; this gradually diminishes going west, its narrowest part, between St. Ives' Bay and Mount's Bay, not exceeding five miles. This tract is probably more diversified in aspect than any of similar extent in the United Kingdom; a ridge of high ground stretches through its entire length, like a huge backbone, forming, from the central parts of the county towards the north coast, extensive districts of mountain and moorland, sometimes rising into bold and picturesque hills, but oftener spreading out into wide extending table-land moors—bleak, barren, and monotonous. To this is succeeded towards the sea, particularly the south coast, rich and fertile valleys, not exceeded in luxuriance or productiveness by any in Devonshire.

The coast also, which, with its various indentations, has a length of probably not less than 200 miles, is equally varied in its features. The extreme west, from Mount's Bay to St. Ives, and the whole line of the north coast, receiving, as they do, the first burst of the Atlantic storms, are magnificent for their savage grandeur, being bounded either by high cliffs, descending steep and rugged into the sea (which is generally the case), or else, where the coast is low, by wide and dreary tracts of drifted sand. The south coast, on the other hand, although far inferior in the grandeur of its scenery, is generally marked by a gentle beauty, clothed with verdure to the very sea level.

GEOLOGICAL STRUCTURE.

The geological structure of this county is of a highly interesting, but, at the same time, an equally complicated, character. In taking a general view of this structure, it will be necessary to include in our range the south-western portions of Devonshire, which are so mixed up with the geology of Cornwall that it is impossible to separate them in their general relations.

GRANITE.—No inconsiderable portion of the surface of Cornwall and South Devon consists of granitic rocks. They may be divided into six principal ranges, one in South Devon and five in Cornwall (including the Scilly Isles), which are, taking them as they occur from east to west:—

1. *Dartmoor range* (in South Devon); the most extensive granitic tract in the two counties; 22 miles long, from north to south, with an average width of 12 to 15 miles.
2. *Bodmin Moor range*, between Launceston and Bodmin; 13 miles long, from north-west to south-east, by eight or nine miles wide.
3. *St. Austell Moor range*, west of Lostwithiel, and north of St. Austell; about 12 miles long, east and west, by four or five miles wide.
4. *Carn Menelez range*, west of Falmouth and Penrhyn; eight or nine miles long, from east to west, by seven miles wide.
5. *Land's End range*, west of Hayle, and west and north of Penzance; 12 or 13 miles in length, east and west, by eight or nine miles wide.
6. *Scilly Isles range*, showing granite over an area of about eight square miles.

Besides these six principal ranges there are ten smaller protuberances, one in South Devon and nine in Cornwall. They are, taking them also from east to west, as follows:—

1. *Hemerdon Ball* (in South Devon), quarter of a mile south of the Dartmoor range, about six miles from Plymouth; two miles long, from north to south.
2. *Hingston Down Boss*, between Callington and the Tamar; two miles long, from east to west, averaging half a mile in width.
3. *Kit Hill Boss*, a smaller protuberance, about a mile west of Hingston Down.
4. *Belovely Beacon.*
5. *Castle-an-Dinas;* these are two small granite bosses, within a mile of each other, about 2½ miles north of the granite range of St. Austell Moor.
6. *Cligga Point*, St. Agnes; a very small protuberance near St. Agnes Beacon.
7. *Carn Marth Boss*, quarter of a mile north of the Carn Menelez range, between Chacewater and Redruth; two miles long, from north to south, by 1½ mile wide.
8. *Carn Brea Boss*, commences a mile west of Carn Marth Boss, and extends west from Redruth Church to Pendarves Park, a distance of three miles, with an average width of about half a mile. These two bosses are surrounded by the richest mining districts in the world.
9. *Tregonning and Godolphin Hills*, about 2½ miles west of Helston and Carn Menelez range; a large boss, 3½ miles long, from north to south, and varying from 1½ to two miles wide. The Great Wheal Vor mining district is on the east flank of this boss.
10. *St. Michael's Mount;* a small protuberance forming the famous mount in Mount's Bay, near Marazion.

Making altogether sixteen distinct granitic masses. Of the smaller bosses, Hingston Down and Kit Hill may be considered as connecting links between the Dartmoor and Bodmin Moor ranges; and the Tregonning and Godolphin Hills and St. Michael's Mount between the Carn Menelez and Land's End ranges. Hemerdon Ball is merely an outlying island of the Dartmoor range; Castle-an-Dinas and Belovely Beacon outlyers of the St. Austell Moor range; and Carn Marth and Carn Brea bosses of the Carn Menelez range. Cligga Point seems an isolated protrusion.

SEDIMENTARY ROCKS.—But by far the greater portion of the surface of this country consists of sedimentary, or stratified, rocks of various characters, but which may be classed generally as *shale* (or killas), *grit*, *slate*, *schist*, and *limestone*, which are all, except the last, classed by Sir Henry De la Beche, in his "Report," under the head of "grauwacke"—a name which is now, however, exploded. Before referring more particularly to these rocks, it may be well at once to impress upon the minds of non-geological readers the fact that they have all been deposited from water in the form of mud, sand, or marl, when the area now forming Cornwall was depressed under the ocean; and that they were subsequently elevated,—during which process large portions were carried away by denudation,—and penetrated by the granitic masses I have referred to, and the elvans and traps I shall describe. During these processes the original deposits became consolidated, and more or less metamorphosed, or altered, into the state we now find them. The geological date of this deposition, and also that of the granitic elevations, are both known, as I shall point out further on. The following is a general description of the most leading classes of these rocks, which I shall more particularly describe in dealing with the various localities where they occur:—

Shale, or killas, is a fine-grained argillaceous rock, such as is generally called clay-slate, although I have restricted the word "slate" (according to recent usage) to rocks of the class following. Shale is characterised, however it may be indurated, or otherwise altered, by still retaining, and splitting in, its original "lamination,"—that is, its original layers of deposition, or bedding. Shale is essentially argillaceous, but it sometimes becomes mixed with arenaceous, or sandy, matter; and when this preponderates it becomes

Grit, or an arenaceous shale, when the siliceous particles are small; if they are large and rounded, it becomes an arenaceous conglomerate; if large and angular, an arenaceous breccia. When the sandy matters entirely preponderate it becomes a *sandstone*.

Slate, or clay-slate, is, like shale, a fine-grained argillaceous rock. It is invariably highly indurated, and differs from shale in having its original lamination entirely superseded by a new fissile structure, called "cleavage," along which the slate splits into plates altogether independent of the original bedding.

Schist is an original sedimentary rock, still more highly altered, or metamorphosed, than slate rocks, by which it has acquired a new fissile structure, called "foliation," obliterating the original lamination. Foliation differs from cleavage in always coinciding with plates of different mineral matter, as in mica-schist, chlorite-schist, hornblende-schist, &c.

Limestone occurs where the original matter deposited was not merely argillaceous or arenaceous, but which also contained abundantly calcareous matters. Limestone is very abundant in South Devon—in a line from Newton and Torquay to Plymouth. It may be well here to point out an error not uncommonly made with respect to these South Devon and Cornish limestones. They are sometimes spoken of as a separate and entirely distinct formation from the slate, or killas. But this is quite incorrect; they are merely bands of calcareous matter, more or less developed, and regularly stratified amongst the slates and shales. These beds are sometimes very pure, and reach a great thickness; but they equally often only form thin bands; and beds are not unfrequently found which are an impure mixture of argillaceous and calcareous matters, or a *calcareous shale*.

ELVAN AND TRAP.—These rocks largely occur in the districts under consideration. *Elvan* is a rock differing but little in its composition from granite, but it is generally marked by being less crystalline in its structure. It occurs in many different states of aggregation, and generally in dykes, or large vein-like masses. It used to be called *felspar-porphyry*, but the local name of elvan has now been adopted in geological language, and is preferable.—*Trap* is a generic name for a large series of rocks of the greenstone family, consisting essentially of felspar and hornblende. They are characterised by not occurring in such regular dykes as the elvans—oftener forming large irregular masses. Miners, particularly in Devon and East Cornwall, are greatly given to speak of greenstone as "elvan," confounding together these two classes of rocks, which are essentially distinct. Elvans and traps are considered by geologists to be igneous eruptive rocks.

SERPENTINE, HORNBLENDE ROCK, &C.—Serpentine occurs in the Lizard district, and at Clicker Tor, in the parish of Menheniot. It is associated at the former place with hornblende rock, and other rocks of an obscure origin. These are probably metamorphic rocks. Metamorphic rocks also occupy the extreme south of Devonshire, in the neighbourhood of the Start, Bolt, and Prawle headlands, below Kingsbridge.

GENERAL GEOLOGICAL RELATIONS.—Formerly the granite of Cornwall and Devon was considered—as was all granite—to be a "primitive" formation,—a rock formed, as we now see it, long before the deposition of any sedimentary rocks, and before the appearance of life on the earth. The slates and shales, or "grauwacke," were likewise considered a "primary" or "transition" formation of indefinite age, but certainly to be classed among the oldest of sedimentary deposits, with the ancient slate rocks of Wales, Cumberland, and Wicklow.

The first of these notions rudely disturbed was that which held all granite to be primitive. From the investigations of the German geologist Von Buch, and subsequently of the French geologist Elie de Beaumont, it was clearly proved that granite was to be found of more recent formation than secondary strata. Following up these investigations, geologists have now shown that granite may be of all ages; and is so far from being essentially primitive, that it is doubtful if there exists any granitic mass of which we cannot clearly prove an origin subsequent to some sedimentary formation. This is the case with the Cornish granite, as I shall point out.

We next come to the age of the slate and shale rocks, or grauwacke. Until 1836 these rocks were universally considered to be an ancient transition formation—of some old Silurian age probably, like the similar rocks of Wales. This notion was an incorrect one, and, consequently, led to considerable confusion, for the following reasons:—These rocks are overlain in South Devon and East Cornwall by the culm measures of Central Devon, the boundary line between them running east from near Tintagel Head, in Cornwall, to the Dartmoor granite, in the neighbourhood of Old Wheal Friendship Mine. Now, it had been long since ascertained that the characteristic fossils of these culm measures were true carboniferous fossils, similar to those of the regular coal measures; and geologists hence proposed to class them as of carboniferous age. This classification was objected to by Sir Henry De la Beche, on the ground that these measures passed gradually, and without any break, into the transition grauwacke of Cornwall, which could not be the case with true carboniferous rocks; inasmuch as in the regular geological sequence the whole of the old red sandstone system, and the newer portion of the Silurian system, would come in between rocks of the supposed age of the grauwacke and the members of the coal formation. Assuming the grauwacke to be of Middle Silurian age at the latest, which every one then did, there can be no question that Sir Henry's objection was unanswerable; but the fact of the fossils being carboniferous fossils was equally unquestionable. So the two sets of facts being incompatible with each other, the question remained unsolved until 1836.

In this year Mr. Lonsdale suggested that the fossils found in the limestones of the South Devon grauwacke rocks were not those of Silurian rocks, but really of a type seemingly intermediate between that system and the carboniferous. Acting on this suggestion, Sir R. Murchison and Prof. Sedgwick carefully re-examined the whole district, and ended by establishing the important conclusion that the grauwacke rocks—the slates, shales, and limestones—of Devon and Cornwall were of the same age as the old red sandstone of other parts, were of more recent formation than the newest of the Silurians, and only immediately preceding the carboniferous in age. They received the name of the "Devonian" system, from their great development in that county, that term being considered synonymous, as to age, with the old red sandstone. The whole of the sedimentary rocks of Cornwall are of this age, with trifling exceptions; the most important being the stratum of the headlands of the south coast between St. Austell and Falmouth, the Dodman, the Nare, and St. Anthony's Head, which are Lower Silurian.

The age of these sedimentary rocks being thus established as Devonian,

it remains to consider the age of the granite. We find this age to be subsequent to the deposition of both the Devonian and carboniferous rocks, for those strata are disturbed and contorted by the granite upheaval. On the other hand, it is ascertained that the new red standstone lies on these rocks entirely undisturbed, so that the granite originated prior to the deposition of that strata. The age of the granite is thus ascertained to be after the carboniferous age, but before the new red sandstone, or about the age of the Permian system.

I have dwelt upon the origin and age of these granitic and sedimentary rocks at some length—probably undue length,—because I still find the exploded notions about their being of "primitive" formation yet rife among many. The notion is not merely incorrect in itself, but it is a bar to the progress of all real geological knowledge. I cannot too much impress upon the minds of my readers who are not already familiar with the fact, that the slate rocks of Cornwall are of comparatively middle age origin, being no older than the old red sandstone; and that the granite is even considerably more recent, being newer than the coal measures.

GEOLOGICAL NOTES ON SOME MINERAL DISTRICTS OF SPAIN.

No. II.—THE HUELVA DISTRICT—(*Continued.*)

The extraordinary number and size of the heaps of ancient slag which are met with in the vicinity of every bulky deposit, sufficiently proves the large scale on which smelting operations were carried on by the ancients; and as they naturally would obtain the necessary fuel on the spot, we are led to infer that, at their time, the country must have been covered with large forests. But, at the present time, we come only now and then across tracts which are covered with brushwood, that is used partly for making charcoal for smelting purposes, and partly for setting on fire the *teleros*, or heaps of ore that are to be roasted. The few scattered pine trees which grow, for example, near the mine of Rio Tinto, are principally used for timbering in the workings in general. Vegetation appears to have greatly suffered from the sulphurous acid fumes that at every mine are created by the roasting of numerous heaps of pyrites in the open air.

The most extensive ancient workings appear to be at Rio Tinto, consisting principally in adits, some of which are of a great length, pits, and galleries, leading to sometimes very large chambers or excavations in the interior of the mineral mass, in many of which we meet with stalactites of sulphate of copper, some of which are of the thickness of a man's body. With respect to ancient workings generally, we have to notice the extraordinary large number of circular pits, bearing in many places marked directions. Their large number, however, is easily explained, when we bear in mind that the ancients were unacquainted with the use of the compass, so that whenever they wanted to drive an adit, or gallery, in a certain direction, they were obliged to sink pits close to one another on the line of the projected adit, and to drive from the bottom of each pit towards the pits on either side of it; in doing so, they were most probably guided by the sounds proceeding from the blows of the respective working parties on either side. The circular shape would naturally be the most convenient for a shaft that had to be sunk by iron and mallet alone, without the aid of gunpowder. An English engineer, who has had many opportunities of exploring ancient workings, stated that he had frequently met with pits the sides of which exhibited still traces of the marks of chisels, or "gads," going downwards in a spiral direction from the right to the left—an appearance which naturally would be the result of a man breaking out the rock by means of a mallet in his right and a pointed iron in his left hand.

There can be no doubt but that such ancient workings might be made to afford great facilities for modern mining operations, and the opening of a mine on a deposit where such ancient workings exist may be rendered considerably cheaper by a judicious use made of existing workings. The modern workings on the various deposits of the district appear as yet insignificant, compared to the ancient workings; and the mineral, where occuring in large "massas," is extracted by a series of galleries traversing each other at right angles, one series of galleries being placed below the other, and so on, all being connected with one another by means of winzes and shafts, and with the surface by means of the latter and by adits. All the galleries, &c., which are situated on the same level with one another are called a "piso." Hence it will be seen that the system of extraction bears great resemblance to that pursued in coal mines, with the difference that here the whole—roof, floors, and pillars—is formed by one and the same massas; so that, in calculating the probable productiveness of any of those "massas" whose extent has been ascertained, we can consider as available for extraction only somewhat less than two-thirds of the remaining mineral, after having duly deducted from its bulk the quantities that have been extracted by the ancients. The mineral masses consist, as already stated, of sulphur ores, carrying in most cases a variable percentage of copper, from ½ up to 5 per cent. on the average, and to a still higher percentage in the case of picked specimens. The various bunches of the Rio Tinto deposit, for example, vary in width from 4 metres to about 100 metres, the average width being estimated at 70 metres; this deposit is superficially traceable to a length of above 2000 metres, and the modern works, though carried on on no small a scale, occupy a comparatively insignificant part of the deposit. I have heard it stated that, according to an estimate by some Spanish engineers, this deposit could yield returns at the rate of from 150,000 tons to 180,000 tons per annum for 11 centuries. Julius.

Libotte's Miners' Safety Apparatus.—M. Libotte's specification, just filed by Mr. Henry, Fleet-street, describes a safety apparatus applicable to coal mine cages in which grips or jaws are employed, being mounted upon shafts capable of being turned to the required extent by means of vertical or horizontal springs, on the releasing of the same by the breakage, slackening, or giving way of the rope or chain by which the cage is suspended, the springs acting directly or indirectly upon the shafts, and their jaws or grips causing the latter to grasp or catch into the shaft-guides with a strong hold. In one arrangement the jaws are serrated, and of a spread-out form, and vertical springs are used, which when released, as by the breaking of the bearing chain, press against a bar with jointed arms, which acts upon cranks on the jaw carrier shafts, causing the jaws to grip the guides. In another arrangement there are springs acting horizontally, kept compressed while the bearing rope is "taut," but released on its breaking or becoming relaxed, and is set free to act through arms, cranks, and shafts in the jaws or grips. In another modification the grip-carrier shafts are worked by a rising and falling frame piece at the top of the cage. Various other modifications are described.

Boston (U.S.), Sept. 30.—The tendency of the money market is stil l towards greater ease. First-class paper of four months passes readily at 6 per cent. Second-class paper, however, is regarded with some distrust. and passes only at comparatively higher rates. Collateral loans, on call, range from 6 to 12 per cent. In mines, there have been considerable fluctuations in prices, with only moderate activity. Ingot copper is held at 23¼ c., cash.—At the Central, the August product was 16¼ tons. Total value of copper sold and on hand from the opening of the mine to July 1, 1859, $133,589; and the total expenditure from the opening of the mine, including estimated indebtedness not settled, to July 1, 1859, $145,000. The prospects of the mine are entirely satisfactory to the shareholders.—Copper Falls:—Total shipments this season are on company's account, 195½ tons; on tributers' account, 75 tons. The east and west vein, known as the "Ash-bed," is now opened down to the 20 fm. level; at this depth the mine increases in richness.—Franklin: Total shipments this season, 100 tons.—Isle Royale: Produce for August, 20 tons; total shipments this season, 196 tons.—Minesota: Produce for August was, in masses, 75½ tons; barrel work, about 52 tons; stamps, about 9½ tons: total, 137 tons. The agent's report for August says—"From the general appearance of the vein in the bottom levels throughout the mine, there is reason to believe we can increase the monthly returns considerably in future, when the ground now being opened becomes available for stoping. We are doing a large amount of mining work, and at a less rate than heretofore."—National: Produce for August was about 40 tons mass and barrel work. The shipments in 1857 were 341 masses, weighing 245,825 lbs. and 157,970 lbs. barrel work, yielding about 82 per cent. ingot, aod sold for $73,363·30. For 1858, 231 masses, 171,582 lbs., and barrel work 139,317 lbs., yielding about 82 per cent. ingot, and sold for $57,162·70. Since the close of navigation in 1858 to August 20 last, the shipments were 207½ tons. The receipts from the opening of the mine have been—From assessments, $110,025; from sales of copper, not including sales of that which has been shipped since Nov., 1858, $219,174·01: total, $329,199·01. The expenditures from the commencement to Aug. 20, 1859, have been $372,968·20. There is an excess of assets over liabilities—exclusive of machinery at the mine and in transitu, valued at $11,750, and exclusive of real estate and improvements—amounting to $27,758·42. Nearly the whole force since June, 1858, has been concentrated on what has been known hitherto as the disputed tract; so that, in fact, a new mine has been opened, yielding in twelve months 233 tons, worth about the actual amount of expenditures during that same period. There are now ready for stoping 2000 fathoms of ground, which in course of six months will be increased to 7000 or 8000 fathoms. For the amount of work done with so large renumeration in the first year of its existence there has been no parallel in the history of mines at Lake Superior. Average wages—Sinking, $10 per feet; driving, $5; stoping, $8·25 per fathom. The approximate yield per fathom is 300 lbs. rough, or 240 lbs. ingot copper.—Rockland: August product, 50½ tons. The agent writes—"We have recently thrown down a mass of about 20 tons."—Dupee, Beck, and Sayles.

Original Correspondence.

LIMESTONE IN THE NEIGHBOURHOOD OF DOLGELLY.

Sir,—It is rather a curious circumstance that the eminent gentlemen employed on the Ordnance Geological Survey should have omitted to note the existence of limestone in this neighbourhood, but it is, nevertheless, a fact. In my rambles, a few days ago, I met with what appeared to me to have been an old limekiln, in a secluded spot, about six miles from Dolgelly, and upon further examination I found the vein from which the stone must have been raised. This led me to extend my explorations, and I subsequently discovered the remains of other limekilns, and the further existence of the limestone vein crossing another stream in the adjoining property. I have sent a sample to London, having first satisfied myself of its nature by the application of hydrochloric acid to the stone, and will at a future time send you further particulars. W. R. W.

Dolgelly, Oct. 17.

MAGNETIC VARIATION.

Sir,—The remarks of your correspondent, "R. S.," respecting the errors in mine plans arising from the want of attention in the variation of the magnetic from the true meridian, need not be confined to any particular case, but may, on the contrary, be considered of general occurrence. To afford the means of checking this error, Mr. T. Sopwith has proposed the erection of two or more conspicuous objects exactly on the meridian line in every mining district, from which the exact amount of variation could always be readily obtained. There are, however, facilities afforded in almost every mine for determining a meridian line; thus, a point may be selected from which some permanent object, such as a mark in the engine chimney, or the vane of a distant spire, will be due north, at this point fix a low stone post, having a hole in the centre of its top to denote the exact point; the actual amount of variation may then be obtained any time by fixing the dial or theodolite carefully over this hole, and directing its sight to the object selected; the degrees between the extremity of the needle and the zero of the instrument will give the magnetic variation. This should be done several times in the course of the year, as the amount of variation is not constant. Simple methods of ascertaining the magnetic variation, and consequently of determining the true meridian, are given in the *Miners' Manual.—Myrtle-street, Liverpool, Oct.* 17. W. Rickard.

MINERS' PROVIDENT ASSOCIATION.

Sir,—I perceive that Mr. Thomas Gascoigne has referred, in the *Newcastle Chronicle*, to my letter upon this subject, inserted in the *Mining Journal* on Oct. 8, and I can only say that I trust all the delegates may entertain the same opinion as Mr. Gascoigne, which, however, I fear is not the case. I was well aware of the tenor of the second clause of the constitution, but if there be want of unanimity and integrity amongst those concerned with the Association, there will be difficulty in bringing it into practial working order. The statement that the success of the Association is becoming daily more apparent, and that its supporters increase in numbers is, doubtless, gratifying, and I sincerely hope that the prediction that all the seeming impossibilities that the opponents of the movement talk of will speedily vanish before the indomitable perseverance of the promoters, but begin to fear that the prospects of benefit are not so great as I had anticipated. The "objectionable rule" to which you referred in your last Journal did not attract my attention, but now I have read it, I certainly think that its effect will be very damaging to the Society; for, as I understand your interpretation, a man who has been paying for a given benefit for an unlimited number of years is liable, through any misfortune to the Association, to have those benefits materially diminished. Now, I think, however much it may tend to prevent the progress of the Association, in the first instance, steps should be taken to guarantee that the collier will receive the benefit he bargains for, as otherwise few will have confidence; but let the miners know that they will never be called upon for higher contributions, and that their benefits will never be lower than proposed, and some good may be done.—*Oct.* 17. An Agent.

MINERS' INSTITUTION FOR CORNWALL AND DEVON.

Sir,—In the Journal of Oct. 8, there was a notice from your Cornish correspondent, of a suggested Miners' Institute for the counties of Cornwall and Devon. I need not say how I shall rejoice at the successful accomplishment of this design, which, under the practical and popular auspices of Mr. Robert Hunt, seems likely to take at last the form of a tangible and definite proposition; and it must be very gratifying to you, after having for many years unceasingly advocated in the Journal the two principal objects which this institute may be expected to aid in realising—that is, a more complete union among miners of all classes, and the promotion and encouragement of sound mining knowledge and education.

A union among miners is a matter of far deeper interest to the success and continued prosperity of honest and legitimate mining than seems at all to be generally understood. Its objects are not merely sentimental, but in the highest degree practical. Every technical profession gains its position before the world, among other men, by its corporate action, by its unity. Whatever may be its tone as a body, that tone is more or less reflected upon all its members in the eyes of the world; while it, in turn, reacts on them, by thus raising up a standard—a principle of action, and an aim of life, that may be worthily followed. The experience of every man of the world will readily furnish him with abundant instances of this spirit—this *esprit de corps*, making brave men of cowards, and keeping natural rogues in the path of strictest honesty. Why should Cornish miners, almost alone among every other profession, be deprived of this *prestige* and position in the eyes of the world—of this protection against the weaknesses of the least worthy among their class, which can alone be gained by the existence of such an institute as that now proposed? There can be no good reason; and no honest and respectable mine agent, who respects himself and his profession, should fail to aid the present proposal by every means in his power. To those among the educated classes who are interested in mining, either professionally, pecuniarily, or as scientific amateurs, I am satisfied that no exhortations are needed to induce them to render their assistance to Mr. Hunt and his friends.

Next comes the all-important question of Mining Education. While mining schools and colleges are springing up spontaneously in all our coal and iron districts, every similar effort, no matter how well supported from without, inevitably fails in Cornwall, the county where, above all, from the natural intelligence of the inhabitants, it might be expected to be most highly appreciated. This apathy, we might almost say passive resistance, to all education on the part of the Cornish miners is certainly not easily accounted for; and a more suicidal policy it is difficult to conceive. The Cornish miner has a noble career before him. His county being the leading metallic mining district of the United Kingdom, his services are naturally sought by British capitalists for every part of the world. With the advantages of education, Cornishmen may for generations have a practical monopoly of mining management wherever British capital is expended on mining. I cannot but believe that the formation of a Miners' Institute will some how or other help to surmount the difficulties which have hitherto beset the question of Mining Education in Cornwall. A society composed, as this should be, of all classes connected or interested with mining, will have more authority in smoothing prejudices, and more experience in meeting difficulties, than any other body could possibly hope to possess, even if constituted under Government auspices. England is distinguished from all other countries by the importance of her independent corporations, which possess a vigorous usefulness, a social power, unknown to exist in any other country, disconnected from the Government. Our great universities, our inns of court, our medical, literary, and scientific corporations and societies, were, and are now, mostly self-constituted bodies, deriving their power and *prestige* more from their universally recognised usefulness, than from any legal position. A career equally important in its sphere is open to a Miners' Institute of Cornwall and Devon; and if the miners of those counties have their own interests, or those of their children, really at heart, they will strain every nerve to see such a society firmly established on a broad and liberal basis.—*Oct.* 20. A Miner.

MANUFACTURE OF IRON—CHOICE OF MILL MANAGERS.

Sir,—On perusing your Journal some time back I noticed a letter upon the advantages which would accrue from the education of puddlers, rollers, and refinery men. Now, all concerned in the manufacture of iron well know that these three classes of men are the bulwarks of the trade, yet how often do we find that these men suffer more than any others from bad management in the works, and especially from bad management of the rolling-mill, where the finishing process is going on; therefore, if anyone should be educated it should be some of the mill managers who are at present in office. There are annually thousands of pounds wasted owing to the mill manager not understanding the rolling department, which I consider the principal process in iron making, for what will it avail the proprietors of iron-works to have an agent who may be fully competent in the puddling department if he do not understand rolling?—such a man would not be worthy of the name of a mill manager, I have known puddlers who have made good mill managers, but take the generality of them, I am sorry to say they prove themselves incompetent, owing to their want of a knowledge of rolling. The mill manager should be selected from those who have worked at rolling, as no one can fill the situation better. If this course were adopted we should hear nothing of hundreds of tons of rails and other kinds of iron being spoilt from want of understanding the proper draft of the rolls, and the cry that "the work does not pay" would be less frequent.

Oct. 17. A Mill Man.

REDUCTION OF POOR COPPER ORES.

Sir,—Until "A Smelter" is in a position to fulfil his promise, made in the *Mining Journal* of Aug. 13, to make public the details of a process for reducing copper ores of 1 per cent at a cost of 40*l.* per ton of copper, I will, to keep the matter afloat, give a few particulars relative to the reduction of two different copper ores, by widely different methods, and at places remote from each other—in Germany and in Norway. In the former instance, at Linz, on the Rhine, the ores consist of copper pyrites, very much disseminated in quartzose gangue. All the ores operated upon must be carefully roasted; those which contain less than 3 per cent. in a blast-furnace 10 feet high, widest in the middle, where there is an opening for the introduction of air for oxydation, and higher up a channel by which the sulphurous gases are let into a chimney 50 feet high. When the ores contain 4 per cent., they are roasted in a reverberatory furnace, as in the heat of a blast-furnace they would slag, or smelt: roasting in heaps is inadmissible; as it is a *sine qua non* in the process that the sulphurets be entirely converted into oxydes. This is by the blast-furnace effected in a much more satisfactory manner than might be expected; the infusible nature of the matrix, and the minute subdivision of the particles of ore, preventing any tendency to slagging: 80 lbs. of small coal is sufficient to roast 1000 lbs. of ore. For roasting, the pieces of ore should not be less than from 1 to 2 in. square, else the temperature gets too high; if too fine the draft will be impeded. After roasting, the ores are ground between rollers to pieces ¼ inch square, in order to present as much surface as possible to the sulphuric acid to which it is now exposed, and to facilitate its action in converting the oxides of the metals present into sulphates. The sulphurous gases are obtained by the calcination of zinc blende, of mundic, or of copper ore, only, when the latter is employed, it smelts in the heat necessary to eliminate the sulphur, and the oxidation is obstructed. The blende is crushed into moderately-sized pieces, having been previously slightly calcined to make it brittle, though not sufficiently so to decompose it, and then exposed to a high temperature in a retort furnace. Above the furnace, and heated by it, a boiler, kept always full of water, delivers it into the same canal as receives the sulphurous gases from the furnace, and which conducts the mixture of air, sulphurous acid gas, and hydrous vapour into the pits where the roasted ores have been deposited. These pits are 24 feet long and broad, and 5 feet deep. Small pillars of masonry on the floor of the pit, 1 foot high, support two layers of natural basaltic columns laid horizontally, the upper layer at right-angles to the other, forming a kind of false bottom to the pit; the 3 feet above the layer of basalt is filled with roasted ore, the coarsest pieces being put at the bottom, and the fine sand on the top. The gases from the furnace and boiler are admitted under the false sole, and ascending through the openings left by the natural inequality of the basalt columns, the nacent sulphuric acid attacks the metallic oxides present in the ores, converting them into soluble sulphates, which are partly dissolved by the water formed by the condensation of the steam, and partly by water thrown over the ore. The solution is pumped from the space between the real and the false bottom into receivers—wooden tubs set in clay—where the copper present is precipitated by means of iron, malleable iron being preferred. The precipitate, or cement copper, is carefully washed in a circular sieve revolving in water, smelted in a reverbatory or blast-furnace into "black copper," and then gathered into rosettes as usual. Green vitriol and zinc, also, are made as by products; the reduction of the latter, however, is carried out by a different company; the mother liquor from the crystallisation of the vitriol is also profitably applied in the reduction of low per cent. natural oxides, the sulphuric acid free in the liquor having the same effect on the natural oxides as the nacent sulphuric acid has on the artificially produced oxides in the roasted ores.

In Norway, at Vesledalen, the ores are also roasted, but not as on the Rhine with a view to expel completely the sulphur, but to effect directly the oxidation of the sulphides into sulphates; and as the situation of the works, far inland, and at a considerable height above the sea, would make iron an expensive means of precipitation, one cheaper and easily accessible had to be found. The ore is iron pyrites, containing an uncertain quantity of copper, from a ½ to 3 per cent. The deposit being large, the cost for mining is trifling. The ore is collected in large heaps on a layer of firewood, by means of which the superincumbent mundic is easily ignited; it burns freely though slowly for weeks or even months, the superabundance of sulphur present acidifying much of the iron and sulphuret of copper. The oxidation continues long after the burning has ceased; even after it has been once lixiviated the action of air and water on the calcined mass produces a further quantity of copper salts, and makes it worth steeping again. The precipitation is conducted in large tanks, the means employed being the introduction of a stream of sulphuretted hydrogen gas into the solution. This gas is economically prepared by passing carburetted hydrogen, or, rather, the produce of the combustion of pine wood, in a retort over a stratum of red-hot mundic. The evolved gases on coming together decompose each other sufficiently to produce an effective and cheap means of precipitation. The precipitate is much less pure than that obtained by means of metallic iron, and its further reduction had given rise to some technical difficulties, which were not entirely surmounted at the period of my visit to the establishment. Even then, however, the manager told me he could deliver Gahr copper at the seaport, Drontheim, at a cost, including mining, smelting, and carriage, of 20*l.* per ton, or $15 per skippund.

Perhaps some of your corrospondents may have inspected the works since I was there, as communications are occasionally addressed to you from Norway, where there are numerous lodes of poor copper ores which cannot be reduced profitably by the usual smelting processes, but which might prove better investments than the silver mines so frequently of late noticed in your Journal. The Kongsberg Mines are unquestionably very remunerative, but the State retains in its own possession the very limited territory where native silver is likely to be found in sufficient quantity to pay for working. A Norwegian company has for some years been exploring the most likely district in the neighbourhood of the Kongsberg Mine, and every year considerable calls have been made. The other setts were taken up by speculators without capital, on the chance of selling them in London; though such a transfer is, by the conditions of the auction at which the setts were acquired, illegal. No doubt silver exists beyond the bounds of the Kongsberg sett, for innumerable trials by private parties, as well as by the Government, prove it; but the quantity has been in every case utterly inadequate to meet the expenses; and whatever is found must be sold at a fixed rate to the royal smelting-house.—*Giessen, Oct.* 13. W. P.

One of the coal seams at St. Etienne, in the south of France, is 40 feet thick. The thickest seam in Staffordshire is 30 ft.

BORING SHAFTS IN THE QUICKSANDS OF THE RHINE—NOVEL MACHINERY USED.

The shaft known as "Rhine Prussian" has been commenced near the village of Homberg, on the left bank of the Rhine, opposite Rhurort; it is being driven forward by the heaviest coal miners in Germany, Hanniel and Co., of Rhurort, a company which has arrived at its present great wealth through the recent increase of the coal trade in the Westphalian field. The numerous difficulties which are encountered, and the novel means employed to overcome them, make this shaft one of the most interesting and important of the trio which we are considering. The plan embraces nothing less than the boring, by means of an enormous auger, driven by steam, a perpendicular hole into the earth to a depth of at least 200 feet, and of a diameter not less than 22 feet. I have spoken in a previous letter of the treacherous nature of the marls to be sunk through, and of the River Rhine which flows but a few hundred yards away, in a porous bed, acting as an inexhaustible feeder to keep the soft strata filled with water. The nature and extent of these strata can be seen from the following section:—

Material.	Thickness.		Formation.
Fine sand and pebbles	Feet	63	Alluvial and drift.
Marl and sand	„	155	Chalk.
Marl without sand	„	20	Chalk.
Clay and schists	„	165	Chalk.
Chalk schists	„	134	Chalk.
Slates	„	38	Coal measures.
Coal seam	Inches	20	
Total to coal	Feet	575	

The boring from which this section was formed was made during 1852 and 1853, the hole being 15 in. diameter at top, and 5 in. at bottom, and protected in the soft beds by an iron tube. In 1857 the present shaft was commenced at a point 800 feet southward from the boring, and sunk into the gravel and marl 79 feet 9 in. below the surface, by a plan which I will mention in my next, when speaking of another shaft. At this depth it was thought that no difficulty would be found in keeping the water down by means of strong steam pumps, and that digging could progress in the ordinary manner. But the soft sand pressed up into the central opening, as soon as the water was drawn out, and no progress could be made. A kind of cast-iron "tubbing" or dam was then contrived, with a sharp lower edge adapted for cutting into the sand, and formed of rings 18 inches high and 24 feet in diameter, with strenthening flanges on the inside arranged so that they could be fastened with screw bolts to one another. Upon the upper edge of this tubbing a set of twelve heavy iron screws were arranged with suitable purchase above. The ring was then screwed down into the soft sand, and new rings added; but so soon as the water was taken out the semi-fluid mass pressed up into the interior, preventing the workmen from going deeper, and at length it was found necessary to abandon the iron tubbing idea.

It was now that the plan for boring with steam on the immense scale mentioned above was matured, and in April, 1859, the preparations were complete, and the machinery started to work. The success of the present plan rests upon applying a counter pressure on the interior of the shaft to resist the force which tends to push the quicksand into the lower opening. This application has been made in the coal field of St. Etienne, in France, by forcing air into sheet-iron cylinders whose lower end was kept on the bottom. The air thus took the place of the sand and water, and although a pressure of some 50 lbs. to the square inch was exerted, the workmen were enabled to proceed with their task in the condensed air. Here, however, a cheaper counterpoise was found for the exterior strata in the water which rises naturally into the shaft, or is pumped into it from a neighbouring well. The work must, therefore, be done entirely under water, and it proceeds at present at a depth of over 100 feet below its surface.

A steam-engine of 12-horse power, situated in a neighbouring house, is geared by means of a strap to this turning arrangement, which is situated in the top of a wooden frame-work, about 60 feet above the centre of the shaft opening. A speed of one revolution per minute is given to the borer, and with each turn it is allowed to sink 3-16ths of an inch. Such is the power applied, that during the progress of the work the iron rod, 4½ in. thick, has been twisted till it now has the appearance of a great screw.

After from two or three hours' turning the sacks are found to be full, and then the whole apparatus must be drawn up again, piece by piece. The sacks appear at the surface swelled with their semi-fluid contents, and spilling from their mouth masses of mud and water. A car, 16 feet long and 12 feet broad, is then run under the sacks, a rope which runs over a pulley, and is attached to a windlass, is fastened to the lower end of each, and the contents are slowly poured out by turning them upside down. It is evident since each knife is no longer than half the diameter of the aperture of the shaft, that the portion of marl immediately below the wall is not bored out: that instead of a hole 22 feet 8 in., which is the diameter of the exterior of the wall, only a hole 14 feet 4 in. is bored. This ring of earth, which it is seen is 50 in. thick, generally falls into the centre, which is kept several feet lower than the bottom of the walls, by the action of the water and the pressure of the superincumbent mass of masonry. But should it prove too firm to be acted upon in this way, another borer is provided, with expansive knives, which spread out after reaching the bottom, and scrape out the earth from under the circular walls. This has not to be used often, the wall generally sinks with the progress of the borer, requiring no power but its own weight.

The progress of the borer varies, of course, with the varying hardness of the strata. Thus, through April it was lowered from 10 to 18 in. per day, but in May from 16 to 25 in., a softer layer having been penetrated.

The work is kept constantly going forward 24 hours of the day. As soon as the wall has sunk 15 feet, which requires about two weeks, a new section must be built and fastened on the top. This is done with bricks and hydraulic mortar, and the whole bound together, and to the former wall, with 16 vertical rods, 1¼ in. in diameter, with at intervals of 10 feet plates of cast-iron, 3 inches broad and 1 inch thick, which run horizontally around the wall.

To obtain a clear idea of the arrangements, imagine a cylinder 24 ft. 9 in. interior diameter, of firm brick wall 30 in. thick, and bound together with iron, resting 75 ft. deep perpendicularly in the quicksand. Inside of this, and at its lower end, a series of metallic rings 24 ft. in diameter and 8 ft. high, which remain from the above-mentioned unsuccessful experiment; and then, on the inside of both, a second brick cylinder, 15 feet interior diameter, with a wall 34 in. thick, which extends to the depth of about 130 ft. The lower end of this last cylinder is composed of a wedge-formed "shoe" of cast-iron, upon which the wall is built, so that the whole affair has the form of a huge punch. Now, imagine that this cylinder is filled with water from near its upper end to the iron shoe, which is the foundation of the wall, thus forming a column as high as the exterior water and sand. In this interior fluid, and upon the bottom, moves the great borer, which, gradually taking the marl out from beneath the wall, allows the whole cylinder to sink slowly into the earth. The action of this remarkable borer can best be described by supposing it just cleaned and ready to be sent below. The "head" hangs above the aperture of the shaft by a wire-rope 3¼ in. thick; it consists of a heavy framework of wrought-iron work, 14 ft. high and 14 ft. 4 ft. wide, secured firmly with screw bolts to a massive rod, also wrought, 4½ in. square, which runs through the bottom of the frame and comes to a point which forms the middle of the hole when boring. About 10 inches above this point branch out, in opposite directions, two enormous cast-steel knives, which rising, as they recede from the centre, at the distance of 7 feet, are bent vertically, in which direction they continue upward 2 ft. These knives are 3 in. broad and 2 in. thick, and their cutting edges are turned towards the right, so that when the instrument is revolved upon the sand a thin slice, 7 ft. wide and half the diameter of the hole, is continually shaved by each knife from the surface—in fact, the apparatus, so far, is very much like a very large auger or reamer. In order to catch and carry out the marl or sand so loosened, a bag of leather and canvass is fastened to the back of each knife, so that the material, passing over the knife as it moves around, is caught by the open mouth of the bag which drags after; each of these sacks holds 80 cubic feet, and when full they weigh together about 15,000 pounds.

We will now suppose the operation of lowering to commence; the engine, of 150-horse power, which is used for the purpose, gradually unwinds the wire-rope and allows the borer to descend into the water. As the upper end of the central rod comes to the surface the whole instrument is securely fastened, and the rope unhitched and attached to a second wrought-iron central rod, 47 ft. long and 4½ in. square, and weighing 3800 pounds; this rod, which contains at its lower end a square socket 10 in. long, is raised above the central rod already submerged and dropped over the protruding square end; a wedge 3 in. high is then run through both and keyed fast. The whole is now lowered 47 ft., then another rod is in the same way attached, and so on till the borer rests upon the sandy bottom. A large cog-wheel, on a vertical shaft, which is capable of a perpendicular movement of 6 ft., is then made fast by a joint, similar to the one described, to the top of the borer-rod, the shaft is securely closed by a trap-door, and the machine is ready to move.

The cylinder thus formed possesses great stiffness, and to render the friction of its outer surface less, a sheeting of plank is fastened around the whole from top to bottom. The bricks necessary for the work are made on the spot, at a cost of $2·10 per 1000; the cost, were they purchased, would be $3·50 per 1000. The engine moving the borer makes 56 strokes per minute, and in order to guard against the breakage which would ensue were any sudden obstruction to come in the way of the knives, a large friction joint intervenes between the power and the resistance, formed of two discs about 3 feet in diameter, which are pressed together with a loaded lever.

The contrivance for lowering the borer into the earth is worthy of notice. It is evident that the weight of the whole apparatus is too great to be allowed to rest entirely upon the bottom while it is revolving, and that such an immense pressure, which, when the boring is at its lowest point, will be equivalent to some 40,000 lbs., would at once sink the instrument into the sand. To prevent this, the whole arrangement is hung upon a giant iron and steel swivel, which depends by a wire-rope precisely above the centre of the shaft. The rope is capable of being lowered by means of a windlass, to which are attached multiplying wheels. Three men stand at the windlass, and as they receive the orders from below allow the rope to unwind.

To run all this machinery, to attend the windlass, fire the boilers, and carry away the material raised, but 18 men are employed. These receive an average of 35 cents for 12 hours' work, finding themselves.

It is at present the hope of the engineers to reach, at the depth of 218 ft. a layer of clay which will be so firm that they can pump the water out, and proceed with wooden walls through the intervening schists 178 feet, till the firm rock is reached. In case, however, the clay proves too soft they must proceed with the boring till a solid stratum is obtained, and if the work prospers, coal will be struck in 1862. R. H. L.

—*United States Railroad and Mining Register.*

BRISTOL MINING SCHOOL.

Mr. Mark Fryar's last lecture was delivered at the Bristol Mining School on Monday, Oct. 3, Mr. Lionel Brough occupying the chair. It consisted of very valuable practical information to the young men on the subject of "How and Where to Sink for Coal in certain Difficult and Peculiar Measures." At the close of the lecture the accompanying copy of Mr. Fryar's letter of resignation was handed over to the Chairman, who took occasion to make some observations on the skill and attention invariably evinced by the lecturer during his long connection with the Bristol School; and on the amount of knowledge he had always brought to bear on all subjects connected with mining. He also stated that he was sure that all then present would join him in expressing their great regret at the loss they were about to sustain; and he was equally certain they would unite with him in wishing similar success to Mr. Fryar in his new and wider field of action.—Mr. Fryar made a suitable reply; and the students and others there assembled offered him their sincere good wishes, and bade him farewell.

TO THE COMMITTEE OF THE BRISTOL SCHOOL OF MINES.

GENTLEMEN,—I beg to resign my situation as Teacher of Practical Mining in your school. I do this with strong feelings of regret that I have not accomplished more than I have in the work you engaged me to do, and shown myself more worthy of the kind courtesy and friendly encouragement which I have at all times received from you during my three years employment in your service.

Although I am leaving you and Bristol, I am not leaving the important work of mining education; nor shall I ever consider myself entirely dissociated from you or your educational schemes for the miners of South Wales and Bristol, but shall always be most happy to render you any assistance in the work that my circumstances or position may admit of.

I shall feel obliged if you will permit me to end my engagement with you at the end of the present quarter,—namely, the last week in September (next month),—as the Glasgow School of Mines' Committee wish me to engage with them from Nov. 1 next.

I sincerely trust that you will not allow either my leaving you or anything else to interfere with the great purpose for which you have been organised. Very much of what is now being done in various parts of the British Islands is entirely due to your efforts and to your influence; and by patient persevering work you will most assuredly be the means of yet greater benefit to your fellow-creatures, to your nation, and to yourselves. I cannot omit to make special mention of your honorary secretary, Handel Cossham, Esq., who, by great kindness to myself, and prompt attention to the business of your school, has gained my highest and most devoted respect and esteem; and of the late much lamented Herbert Mackworth, Esq., whose zeal in the work of mining education, and whose kind attention and assistance in the business of the school shall ever be held by me in sacred remembrance; also of Lionel Brough, Esq., than whom no one is better qualified by intelligence, experience, and prudence, to render you important and efficient assistance in your great and good work. With most ardent and sincere wishes for the success of the school,

I remain, Gentlemen, your humble and obedient servant,

School of Mines, Nelson-street, Bristol, Aug. 9. MARK FRYAR.

DIVIDENDS PAID BY BRITISH AND IRISH MINES

IN THE QUARTER AND NINE MONTHS, ENDING SEPT. 30, 1859.

No. of Shares.	Mine.	Quarter ending Sept. 30. Per share.	Amount.	Nine months ending Sept. 30. Per share.	Amount.
700	Aberdovey	£ —	£ —	£0 10 0	£ 350
5120	Alfred Consols	—	—	0 5 0	1,280
4000	Bedford United	—	—	0 10 0	2,000
200	Botallack	2 10 0	500	10 0 0	2,000
1000	Carn Brea	2 0 0	2,000	8 0 0	8,000
2500	Central Mines	0 4 0	500	0 4 0	500
256	Copper Hill	2 10 0	640	2 10 0	640
128	Cwmystwith	10 0 0	1,280	35 0 0	4,480
1055	Craddock Moor	0 10 0	527½	1 2 0	1,160½
867	Cwm Erfin	—	—	0 10 0	433½
280	Derwent	5 0 0	1,400	5 0 0	1,400
4076	Devon and Cornwall	—	—	0 2 6	509½
1024	Devon Great Consols	14 0 0	14,336	38 0 0	38,912
358	Dolcoath	8 0 0	2,864	30 0 0	10,740
300	East Daren	2 0 0	600	8 0 0	2,400
512	East Wheal Basset	15 0 0	7,680	29 0 0	14,848
2048	East Wheal Lovel	0 5 0	512	0 5 0	512
5700	Exmouth	0 2 6	712½	0 7 0	1,994½
2560	Foxdale (Isle of Man)	—	—	1 0 0	2,560
486	Gramber and St. Aubyn	4 0 0	1,944	10 10 0	5,103
6000	Great South Tolgus	0 7 0	2,100	1 7 0	8,100
1024	Herodsfoot	—	—	1 7 6	1,408
5000	Kelly Bray	0 2 0	500	0 2 0	500
160	Levant	—	—	10 0 0	1,600
400	Lisburne	3 0 0	1,200	17 0 0	6,800
1024	Mary Ann	2 0 0	2,048	6 10 0	6,656
20000	Mining Co. of Ireland	0 4 10	4,900	0 9 8	9,800
1800	Minera	4 10 0	8,100	10 0 0	18,000
5000	North Bolcoath	—	—	0 5 0	1,250
6400	Par Consols	—	—	1 0 0	6,400
200	Phœnix	—	—	25 0 0	5,000
560	Providence	4 0 0	2,240	15 0 0	8,400
1000	Polberro	—	1,328	—	2,435½
1024	Rosewarne and Herland	—	—	2 0 0	2,048
470	St. Ives Consols	6 10 0	3,055	19 0 0	8,930
512	South Caradon	10 0 0	5,120	25 0 0	12,800
256	South Garras	—	—	4 0 0	1,024
512	South Tolgus	4 0 0	2,048	10 0 0	5,120
496	South Wheal Frances	8 10 0	4,216	23 10 0	11,656
6000	Tincroft	0 5 0	1,500	0 15 0	4,500
6000	Tolvadden	0 3 0	900	0 9 0	2,700
1040	Trelawny	1 5 0	1,300	4 15 0	4,940
572	Trelyon Consols	1 0 0	572	2 0 0	1,144
200	Trumpet Consols	4 0 0	800	4 0 0	800
400	United Mines	2 10 0	1,000	11 10 0	4,600
512	Wendron Consols	2 0 0	1,024	4 10 0	2,296
6000	West Basset	0 14 0	4,200	1 16 0	10,800
512	West Caradon	8 0 0	4,096	13 10 0	6,912
400	West Seton	9 0 0	3,800	31 0 0	12,400
240	Wheal Bal	1 0 0	240	2 0 0	480
512	Wheal Basset	6 0 0	3,072	24 0 0	12,288
256	Wheal Buller	5 0 0	1,280	14 0 0	3,584
5120	Wheal Charlotte	0 1 6	386¼	0 7 0	1,796½
500	Wheal Clifford	5 0 0	2,500	10 0 0	5,000
1024	Wheal Grylls	0 7 6	384	0 17 6	896
1024	Wheal Kitty (Leland)	—	—	1 0 0	1,024
5000	Wheal Kitty (St. Agnes)	0 2 0	500	0 4 6	1,125
4800	Wheal Ludcott	0 4 0	960	0 4 0	960
896	Wheal Margaret	2 0 0	1,792	10 10 0	9,408
100	Wheal Mary	—	—	10 0 0	1,000
80	Wheal Owles	5 0 0	400	10 0 0	800
198	Wheal Seton	2 10 0	495	11 0 0	2,178
5000	Wicklow Mining Co.	—	—	3 5 0	16,250
	Totals		£103,352		£325,632*

* This includes 712*l.* 5*s.* for Exmouth, omitted in last Review.

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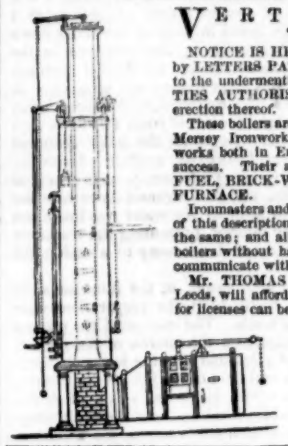

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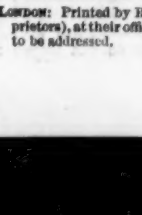

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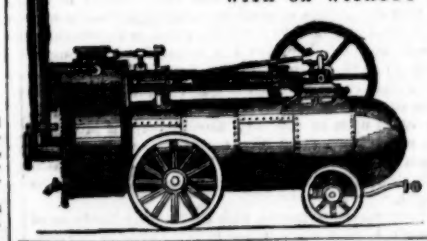

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